Original Article

Race Versus Place of Service in Mortality Among Medicare Beneficiaries With Cancer

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BACKGROUND: Evidence suggests that excess mortality among African-American cancer patients is explained in part by the healthcare setting. The objective of this study was to compare mortality among African-American and Caucasian cancer patients and to evaluate the influence of attendance at a National Cancer Institute (NCI)-designated comprehensive or clinical cancer center. **METHODS:** The authors conducted a retrospective cohort analysis of Medicare beneficiaries with an incident diagnosis of lung, breast, colorectal, or prostate cancer between 1998 and 2002 who were identified from Surveillance, Epidemiology, and End Results data. Multivariate logistic regression models were used to assess the impact of NCI cancer center attendance and race on all-cause and cancer-specific mortality at 1 year and 3 years after diagnosis. **RESULTS:** The likelihood of 1-year and 3-year all-cause and cancer-specific mortality was higher for African Americans than for Caucasians in crude and adjusted models (cancer-specific adjusted: Caucasian referent, 1-year odds ratio [OR], 1.13; 95% confidence interval [CI], 1.07-1.19; 3-year OR, 1.23; 95% CI, 1.17-1.30). By cancer site, cancer-specific mortality was higher among African Americans at 1 year for breast and colorectal cancers and for all cancers at 3 years. NCI cancer center attendance was associated with significantly lower odds of mortality for African Americans (1-year OR, 0.63; 95% CI, 0.56-0.76; 3-year OR, 0.71; 95% CI, 0.62-0.81). With Caucasians as the referent group, the excess mortality risk among African Americans no longer was observed for all-cause or cancer-specific mortality risk among patients who attended NCI cancer centers (cancer-specific mortality:1-year OR, 0.95; 95% CI, 0.76-1.19; 3-year OR, 1.00; 95% CI, 0.82-1.21). **CONCLUSIONS:** African-American Medicare beneficiaries with lung, breast, colorectal, and prostate cancers had higher mortality compared with their Caucasian counterparts; however, there were no significant differences in mortality by race among those who attended NCI cancer centers. The results of this study suggested that place of service may explain some of the cancer mortality excess observed in African Americans. ***Cancer*** **2010;116:000–000.** © *2010 American Cancer Society*.

KEYWORDS: healthcare disparities, quality of healthcare, mortality, health facilities.

Recent efforts to understand racial and ethnic health disparities have examined the extent to which individual, social, and healthcare factors contribute to observed disparities. The Institute of Medicine reviewed a large number of studies and reported that racial/ethnic disparities exist but diminish somewhat when accounting for variation in health insurance coverage and system attributes that influence access to and quality of healthcare.[1] The role of these factors in health disparities still are not understood well and are understood even less for cancer care.

It has been demonstrated repeatedly that cancer-related mortality among African-American cancer patients is higher than among Caucasian cancer patients, although the causal factors are not clear. A 2007 Robert Wood Johnson Foundation review and synthesis focused on disparities in access to and quality of healthcare and drew several cancer-specific conclusions: Breast cancer screening is similar for blacks and whites when adjusting for other factors, and differences in cancer treatment between blacks and whites are significant, in that blacks are less likely to undergo newer treatments and invasive

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For this study, the linked Surveillance, Epidemiology, and End Results (SEER)-Medicare database was used. The interpretation and reporting of these data are the sole responsibility of the authors. The authors acknowledge the efforts of the Applied Research Program (National Cancer Institute); the Office of Research, Development, and Information (Centers for Medicare and Medicaid Services); Information Management Services, Inc.; and the SEER Program tumor registries in the creation of the SEER-Medicare database.

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treatments.[2] At the same time, other evidence demonstrates that blacks and whites who are treated in the same healthcare setting receive similar cancer care.[3-5] Other studies[6,7] that were not confined to cancer care reported that blacks and whites in Medicare managed care plans were comparable in their receipt of recommended processes of care but differed significantly in intermediate outcomes, such as blood pressure control in hypertensive patients.

Although differences in treatment and mortality have been examined for African-American and Caucasian cancer patients, very little effort has focused on racial/ethnic differences in where cancer care is received. The objective of the current study was to assess whether place of service is associated with differences in mortality for African-American and Caucasian patients with lung, breast, colorectal, or prostate cancer in the Medicare population.

MATERIALS AND METHODS

Study Population and Data

We used Surveillance, Epidemiology, and End Results (SEER)-Medicare data to identify incident primary cases of lung, breast, colorectal, and prostate cancers from 1998 through 2002 with linked claims through 2003. The 14 SEER registries represent approximately 26% of the US population.[8] For the cancer sites that were included (lung, breast, colorectal, and prostate), most occur in individuals aged >65 years.[9]

We did not include individuals from Hawaii. because the restricted variable, patient zip code, was not available for this state. Washington state residents were excluded because of missing data from the NCI cancer center in the Seattle/Puget Sound registry (N = 15,661). From a total of 558,663 cancer cases, we excluded 329,520 based on several criteria, including: unequal Part A and Part B Medicare enrollment (n = 24,657), which can limit ascertainment of services; any enrollment in a Medicare risk-bearing health maintenance organization in the 12 months before diagnosis (n = 113,854); aged <66 years at diagnosis (n = 121,411); indeterminate month of diagnosis (n = 2357); initial entitlement because of end stage renal disease (n = 164); cancer diagnosis before 1998 (n = 23,789); death within 1 month of diagnosis (n = 20,247); and absence of Medicare Provider Analysis and Review (MedPAR) or Outpatient claims in the first 12 months after diagnosis (n = 7380). Patients with only 1 hospital-based claim (MedPAR or Outpatient) in the first year after diagnosis (n = 3974) were excluded further for the main analysis, because assignment to a care setting based on 1 claim did not meet our threshold; however, these patients were included in subsequent sensitivity analyses. Because of small numbers, individuals who reported race other than Caucasian or African American were excluded from further analysis (n = 9743).

Variables

The main variables of interest were race, NCI cancer center attendance, and overall and cancer-specific mortality at 1 year and 3 years. Racial categories included Caucasian and African American and were mutually exclusive. Race was self-designated during the application processing at the Social Security Administration. We excluded other racial/ethnic categories based on previous studies using this cohort that demonstrated a lack of statistical power.

During our study period (1998-2003), 47 institutions held continuous designation as NCI-designated comprehensive or clinical cancer centers (hereafter referred to as "NCI cancer centers"). Of these, 15 were located within SEER areas corresponding to the most recent complete data. NCI cancer center attendance was defined as 2 or more claim-days for inpatient or outpatient procedural care occurring at an NCI cancer center within 12 months of the index cancer diagnosis as recorded by SEER.[10] A claim-day was defined as 1 calendar date on which 1 or more of the above claims occurred; inpatient stays were considered as 1 claim, and outpatient claims (those from institutional outpatient providers) that occurred during an inpatient stay were not counted. An index cancer was defined as the first primary cancer of the breast, lung, colon/rectum, or lung within the study period. Claims were identified as occurring at an NCI cancer center through the SEER-Medicare Hospital File.[11]

We used the date of death as recorded in the Medicare Denominator File, in conjunction with date of diagnosis, to determine all-cause and cancer-specific mortality at 1 year and 3 years. Cause of death was obtained from SEER records. To account for possible referral and/or healthcare encounter patterns that might influence mortality, we determined the dominant physician care type in the 6 months before diagnosis. This measure was derived by tabulating physician encounters as recorded in carrier claims according to physician type (generalist or specialist) and assigning primary care predominance to those with ≥50% generalist care. We also adjusted for comorbid conditions identified by International Classification of Diseases, 9th Revision (ICD-9) codes for all hospital and physician encounters within 12 months preceding the

date of diagnosis and then calculated a Charlson score, which was modified to exclude solid tumors.[12-15] Stage at diagnosis was based on the TNM classification (T1-T4), as recorded by SEER registries. The receipt of cancer-directed surgery in the first year after diagnosis was determined using procedure codes from the ICD-9 and Current Procedural Terminology.

Group-level variables included the median household income and educational attainment for the zip code of residence, travel time to the nearest NCI cancer center, travel time to the nearest academic-based care, and per-capita oncologist supply, as described previously.[16] The median income and median education by zip code was 99% correlated; thus, we included only median income in subsequent analyses.

Statistical Analysis

We evaluated 1-year and 3-year all-cause and cancer-specific mortality for African Americans and Caucasians by modeling mortality as a logit function of NCI cancer center attendance and race. We evaluated models of 1-year and 3-year mortality for African Americans compared with Caucasians (referent), with and without adjusting for NCI cancer center attendance, age, sex, stage at diagnosis, travel time to nearest NCI cancer center, cancer site, predominance of primary care before diagnosis, median household income quintile for zip code of residence, and SEER registry at diagnosis. We evaluated models stratified by cancer site and for all cancers combined. We also examined the effect of NCI cancer center attendance on 1-year and 3-year mortality stratifying by race. The logistic regression models of mortality were then stratified by NCI cancer center attendance to assess potential interactions between race and place of cancer care. We performed post hoc analyses to examine differences in baseline characteristics, such as comorbidities, disease stage, and the number of primary tumors, and differences in the likelihood of undergoing cancer-directed surgery. To account for potential correlation of unmeasured factors, we also applied random effects models with clustering at the level of the hospital referral region and separately for SEER registry. Because variances were exceedingly low for residuals from these random effects models (0.04), here, we report only multivariate logistic regression models.

All analyses were performed using Stata statistical software (version 9.2; Stata Corporation, College Station, Tex). This study was approved by the Committee for Protection of Human Subjects at Dartmouth Medical School.

RESULTS

The analytic sample consisted of 201,305 Medicare beneficiaries, of whom 18,008 (8.9%) were African American (Table 1). A higher proportion of African Americans attended an NCI cancer center than Caucasians (11.1% vs 6.9%). Some of the notable characteristics that differed between African Americans and Caucasians who attended NCI cancer centers included: 1) predominance of primary care before diagnosis (NCI cancer center attendees: Caucasian, 40.5%; African American, 49.6%; non-NCI cancer center attendees: Caucasian, 46.5%; African American, 55.8%), 2) the number of comorbidities ($\geq$5 comorbidities: NCI cancer center attendees: Caucasian, 2.5%; African American, 3.9%; non-NCI cancer center attendees: Caucasian, 3.8%; African American, 6%), and receipt of cancer-directed surgery (NCI cancer center attendees: Caucasian, 60.4%; African American, 53.8%; non-NCI cancer center attendees: Caucasian, 58.2%; African American, 49.9%) (Table 1). These factors were included in subsequent adjusted models.

Overall cancer-specific mortality occurred in a higher proportion of African American patients compared with Caucasian at both 1 year and 3 years (1 year, 18% vs 14.7%, respectively; 3 years, 25% vs 20%, respectively) (Table 2). These differences in mortality were nearly the same for patients who did not attend NCI cancer centers. Among NCI cancer center attendees, no material differences in mortality were observed by race (cancer-specific mortality at 1 year: African Americans, 12.3%; Caucasians, 12.4%; cancer-specific mortality at 3 years: African Americans, 19.9%; Caucasians, 20%).

To examine the observed differences in mortality by race and NCI cancer center attendance while accounting for covariates, we developed logistic regression models. First, we compared the likelihood of 1-year and 3-year mortality between Caucasians and African Americans in our study population. Crude models demonstrated the expected greater odds of mortality at both 1 year and 3 years for African Americans relative to Caucasians (Table 3). Higher odds for 1-year and 3-year all-cause mortality among African Americans compared with Caucasians persisted, although it was attenuated in models that were adjusted for age at diagnosis, sex, travel time to the nearest NCI cancer center, attendance at an NCI cancer center, predominance of primary care before diagnosis, disease

Table 1. Characteristics of African-American and Caucasian Medicare Beneficiaries With an Incident Diagnosis of Breast Cancer as Recorded in the Surveillance, Epidemiology, and End Results Program From 1998 to 2002 (n=201,305)

	NCI Cancer Center Attendance: No. of Patients (%)[a]			
	Caucasians		African Americans	
Variable	Yes	No	Yes	No
Total	12,690 (6.9)	170,607 (93.1)	1993 (11.1)	16,015 (88.9)
Women	5631 (44.4)	82,768 (48.5)	867 (43.5)	6944 (43.4)
Predominant primary care[b]	5136 (40.5)	79,391 (46.5)	988 (49.6)	8930 (55.8)
Rurality				
Urban/suburban	10,339 (81.4)	132,361 (77.6)	1968 (98.8)	14,117 (88.2)
Large town/rural	2351 (18.6)	38,246 (22.4)	25 (1.2)	1898 (11.8)
Cancer site				
Breast	2933 (23.1)	41,662 (24.4)	465 (23.3)	3126 (19.5)
Lung	3178 (25)	39,644 (23.2)	383 (19.2)	3632 (22.7)
Colon/rectum	2407 (19)	40,662 (23.8)	336 (16.9)	3673 (22.9)
Prostate	4172 (32.9)	48,639 (32.9)	809 (40.6)	5584 (34.9)
Charlson score				
0	8338 (65.7)	104,210 (61.1)	1171 (58.8)	8436 (52.7)
1-2	3041 (24)	43,371 (25.4)	528 (26.5)	4610 (28.8)
3-4	993 (7.8)	16,604 (9.7)	216 (10.8)	2005 (12.5)
≥5	318 (2.5)	6422 (3.8)	78 (3.9)	964 (6)
Cancer-directed surgery	7660 (60.4)	99,213 (58.2)	1072 (53.8)	7985 (49.9)
Stage				
I	2817 (22.2)	42,024 (24.6)	419 (21)	2852 (17.8)
II	1697 (15.7)	27,107 (15.9)	224 (11.2)	2390 (14.9)
III	1814 (14.3)	23,189 (13.6)	249 (12.5)	2283 (14.3)
IV	1943 (15.3)	22,189 (13)	286 (14.3)	2608 (16.3)
Unknown	4419 (34.8)	56,158 (32.9)	815 (40.9)	5882 (36.7)
Age at diagnosis; Median [interquartile range], y	73 [69-77]	75 [70-80]	73 [69-77]	74 [69-79]
Travel time to nearest: Median [interquartile range], min				
NCI cancer center	28 [16-64]	55 [24-137]	10 [7-15]	29 [15-152]
Academic-based care	19 [11-50]	25 [13-70]	7 [5-8]	10 [6-24]
Income of zip code in $1000: Median [interquartile range]	48.6 [36.1-60.4]	46.4 [33.5-59.1]	31.8 [24.6-41.0]	32.2 [25.1-44.3]
Physician supply by hospital referral region: Median [interquartile range]				
Primary care, per 1000	1.3 [1.0-1.9]	1.2 [0.9-1.6]	1.0 [0.8-2.3]	1.2 [0.8-1.5]
Oncologists, per 100,000	3.4 [2.3-4.3]	2.5 [2.0-3.8]	3.8 [3.8-3.8]	3.7 [2.4-3.8]

NCI indicates National Cancer Institute.
[a]NCI cancer center attendance was defined as having two or more claim-days in the first 12 months following diagnosis.
[b]Predominant primary care was defined as having the same number or equal numbers of primary care visits and specialist visits in the 6 months before diagnosis.

stage at diagnosis, cancer site, rurality, comorbidities, median household income for zip code of residence, and SEER registry of residence (Table 3). The likelihood of cancer-specific mortality was similar to that of all-cause mortality (Table 3). To account more fully for differing risks of mortality based on cancer site, we performed logistic regression models stratified by cancer site. An excess risk of mortality was observed for African Americans (with Caucasians as the referent group) for all 4 cancers, with the strongest effect observed at 3 years (Fig. 1) (1-year mortality: breast cancer: OR, 1.19; 95% confidence interval [CI], 1.03-1.37; lung cancer: OR, 1.10; 95% CI, 1.02-1.19; colorectal cancer: OR, 1.19; 95% CI, 1.08-1.31; prostate cancer: OR, 1.12; 95% CI, 0.99-1.26; 3-year mortality: breast cancer: OR, 1.22; 95% CI, 1.10-1.36; lung cancer: OR, 1.15; 95% CI, 1.06-1.24; colorectal cancer: OR, 1.30; 95% CI, 1.20-1.41; prostate cancer: OR, 1.18; 95% CI, 1.08-1.28).

On the basis of previous evidence of a mortality benefit among NCI cancer center attendees at 1 year and 3 years after diagnosis,[17] we sought to examine whether the benefit was observed for both African Americans and Caucasians. Stratifying our mortality models by race, NCI cancer center attendance was associated with a significant decrease in the likelihood of 1-year and 3-year mortality for both African Americans and Caucasians, with a

Table 2. Characteristics of African-American (n=18,008) and Caucasian (n=183,297) Medicare Beneficiaries With Breast, Lung, Colorectal, or Prostate Cancer at 1-Year or 3-Years After Diagnosis

	Mortality: No. of Patients (%)					
	Caucasians			African Americans		
Variable	None	Cancer-Specific	Other Cause	None	Cancer-Specific	Other Cause
1-Year mortality						
Overall	148,86 (81)	27,008 (14.7)	7453 (4)	13,865 (77)	3164 (18)	979 (5)
NCI cancer center attendance						
No	138,084 (80.9)	25,430 (14.9)	7093 (4.2)	12,190 (76.1)	2918 (18.2)	907 (5.7)
Yes	10,752 (84.7)	1578 (12.4)	360 (2.8)	1675 (84)	246 (12.3)	72 (3.6)
Cancer site						
Breast	41,827 (93.8)	1622 (3.6)	1146 (2.6)	3205 (89.2)	252 (7)	134 (3.7)
Lung	22,172 (51.8)	18,195 (42.5)	2455 (5.7)	1807 (45)	1915 (47.7)	293 (7.3)
Colorectal	35,106 (81.5)	5479 (12.7)	2484 (5.8)	3019 (75.3)	672 (16.8)	318 (7.9)
Prostate	49,731 (94.2)	1712 (3.2)	1368 (2.6)	5834 (91.3)	325 (5.1)	234 (3.6)
Stage						
I or II	68,545 (93.1)	2567 (3.5)	2533 (3.4)	5325 (90.5)	280 (4.8)	280 (4.8)
III or IV	27,819 (56.7)	18,801 (38.3)	2455 (5)	2805 (51.7)	2268 (41.8)	353 (6.5)
Unknown	52,472 (82.6)	5640 (9.3)	2465 (4.1)	5735 (85.6)	616 (9.2)	346 (5.2)
No. of comorbidities						
0	96,797 (86)	12,942 (11.5)	2809 (2.5)	7868 (81.9)	1401 (14.6)	338 (3.5)
1-2	35,945 (77.4)	8222 (17.7)	2245 (4.8)	3918 (76.3)	946 (18.4)	274 (5.3)
3-4	12,028 (68.3)	4131 (23.5)	1438 (8.2)	1490 (67.1)	533 (24)	198 (8.9)
≥5	4066 (60.3)	1713 (25.4)	961 (14.3)	589 (56.5)	284 (27.3)	169 (16.2)
3-Year mortality						
Overall	12,217 (73)	37,523 (20)	13,557 (7)	11,745 (66)	4546 (25)	1717 (9)
NCI cancer center attendance						
No	122,733 (71.9)	35,003 (20.5)	12,871 (7.5)	10,293 (64.3)	4150 (25.9)	1572 (9.8)
Yes	9484 (74.5)	2520 (20)	686 (5.4)	1452 (72.8)	396 (19.9)	145 (7.3)
Cancer site						
Breast	38,893 (87.2)	3014 (6.8)	2688 (6)	2846 (79.2)	459 (12.8)	286 (8)
Lung	16,469 (38.5)	22,902 (53.5)	3451 (8)	1216 (30.3)	2413 (60.1)	386 (9.6)
Colorectal	30,651 (71.2)	8256 (19.2)	4162 (9.6)	2446 (61)	1059 (26.4)	504 (12.6)
Prostate	46,204 (87.5)	3351 (6.4)	3256 (6.1)	5237 (81.9)	615 (9.6)	541 (8.5)
Stage						
I or II	63,134 (85.7)	5272 (7.2)	5239 (7.1)	4773 (81.2)	566 (9.5)	546 (9.3)
III or IV	21,645 (44.1)	23,930 (48.8)	3500 (7.1)	1950 (35.9)	2983 (55)	493 (9.1)
Unknown	47,438 (78.3)	8321 (13.7)	4818 (8)	5022 (75)	997 (14.9)	678 (10.1)
No. of comorbidities						
0	88,359 (78.5)	18,588 (16.5)	5601 (5)	6867 (71.5)	2098 (21.8)	642 (6.7)
1-2	31,008 (66.8)	11,311 (24.4)	4093 (8.8)	3274 (63.7)	1366 (26.6)	498 (9.7)
3-4	9793 (55.6)	5410 (30.7)	2394 (13.6)	1180 (53.2)	719 (32.3)	322 (14.5)
≥5	3057 (45.4)	2214 (32.8)	1469 (21.8)	424 (40.7)	363 (34.8)	255 (24.5)

NCI indicates National Cancer Institute.

somewhat greater decrease for African Americans (1-year mortality: Caucasians: OR, 0.77; 95% CI, 0.72-0.82; African Americans: OR, 0.65; 95% CI, 0.55-0.79; 3-year mortality: Caucasians: OR, 0.95; 95% CI, 0.89-1.00; African Americans: OR, 0.74; 95% CI, 0.63-0.86) (Fig. 2). We further examined the interaction of NCI cancer center attendance with race by comparing mortality among African Americans and Caucasians for those patients who attended an NCI cancer center and those who did not (Table 4). When stratifying by NCI cancer center attendance, we observed that the adjusted 1-year and 3-year all-cause and cancer-specific mortality excess for African Americans was not evident for attendees (Table 4). Post hoc analyses to investigate potential explanatory factors for the observed mortality differences revealed a greater likelihood for African Americans to be diagnosed at a late disease stage and a lower likelihood to undergo cancer-directed surgery (data not shown). These differences were accounted for largely by NCI cancer center attendance.

Table 3. Comparison of Crude and Adjusted Predictive Models of Mortality for African Americans Relative to Caucasians at 1 Year and 3 Years After Diagnosis Among Medicare Beneficiaries (n=201,305) With an Incident Diagnosis of Breast, Lung, Colon/Rectal, or Prostate Cancer as Identified in Surveillance, Epidemiology, and End Results-Medicare Data From 1998-2002

	Mortality: OR (95% CI)		
Race/Ethnicity	Crude	Adjusted Overall[a]	Adjusted Cancer-Specific
1-Year mortality			
Caucasian	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
African American	1.29 (1.24-1.34)	1.16 (1.10-1.22)	1.13 (1.07-1.19)
3-Year mortality			
Caucasian	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
African American	1.38 (1.34-1.43)	1.22 (1.17-1.28)	1.23 (1.17-1.30)

OR indicates odds ratio; CI, confidence interval.

[a]Adjusted models included the covariates age at diagnosis; sex; travel time to the nearest National Cancer Institute cancer center; predominance of primary care before diagnosis; cancer site; rurality; comorbidities; Surveillance, Epidemiology, and End Results registry of residence at diagnosis; median household income of zip code at diagnosis; and year of diagnosis.

DISCUSSION

The current results suggest a strong role for place of service in cancer mortality disparities by race. We observed an overall, all-cause mortality excess for African-American Medicare beneficiaries compared with Caucasians that was similar to the range reported in the literature (20%-30%).[18-28] These 1-year and 3-year mortality disparities consistently were significant across the 4 major cancers we examined, even when we accounted for racial differences in stage at diagnosis, comorbidities, and socioeconomic measures. NCI cancer center attendance has been associated with decreased mortality in this population.[29] The current study demonstrates that this mortality benefit is similar for African Americans and Caucasians. Specifically, this study provides evidence that, when African-American and Caucasian cancer patients attend similar types of specialized cancer care settings, all-cause mortality and cancer-specific mortality are similar.

The idea that racial disparities in health outcomes are mediated by different care is well documented. Most of this evidence stems from studies of differential treatment patterns for minorities. The majority of population-based studies examining cancer treatment differences between African Americans and Caucasians have demonstrated that African Americans are less likely to receive surgery, chemotherapy, radiation, and surveillance.[1,28,30-38] A driving force behind these treatment differences appears to be the location of care in addition to other factors, such as treatment choices. That is, African Americans and Caucasians with comparable baseline characteristics who attend the same facilities receive similar treatment. However, much less evidence is available for the role of facilities/healthcare systems than for specific treatments. Studies within equal access systems, such as the military, have demonstrated an absence of racial disparities for cancer and acute myocardial infarction.[39-41] An examination of facility-level racial disparities in treatment suggested that the effect of the hospital attended was more influential than race in explaining observed population-level racial disparities.[42-44]

Focusing on NCI cancer centers in assessing the influence of race versus place on mortality is salient for

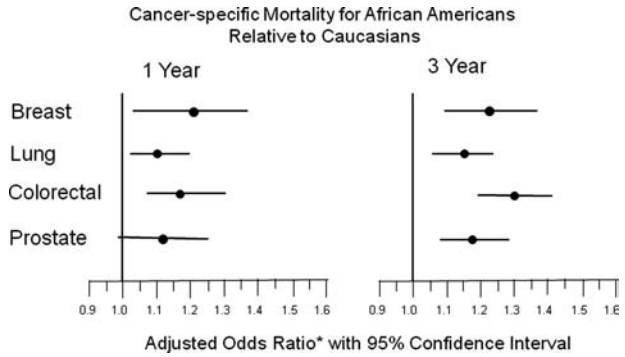

Figure 1. Predictive models are illustrated of 1-year and 3-year cancer-specific mortality as a function of cancer site in African-American Medicare beneficiaries compared with Caucasian beneficiaries who had an incident diagnosis of breast, lung, colon/rectal, or prostate cancer as identified in Surveillance, Epidemiology, and End Results (SEER)-Medicare data from 1998 through 2002. Adjusted models include the covariates age at diagnosis, sex, travel time to the nearest National Cancer Institute (NCI)-designated comprehensive or clinical center, predominance of primary care before diagnosis, stage, rurality, comorbidities, median household income for zip code of residence at diagnosis, SEER registry of residence at diagnosis, and year of diagnosis.

cancer patients given their high degree of specialization for cancer care and research and the demonstrated clinical benefit associated with these institutions.[29,45] Furthermore, examining cancer settings or healthcare systems makes sense in racial disparities research, because organizations and facilities represent actionable units. That is, identifying differences in treatment patterns can lead to change only through systems that provide that treatment.

Although attendance at an NCI cancer center obviated the mortality differences between African Americans and Caucasians in our study, racial disparities in cancer are complex and multifactorial. The oncology health disparities model of Polite et al illustrates the likely interplay of lifestyle and environment factors, personal health beliefs, health system factors, and biologic factors.[33] In our subanalysis of potential intervening variables in the overall relation between race and mortality, we observed that African Americans were more likely to be diagnosed at a later stage, were less likely to undergo cancer-directed surgery, and, as reported previously by this group, were more likely to attend an NCI cancer center.[10] It has been established that African Americans present with later disease stage for breast cancer[46-48] and colorectal cancer,[24,49] and lower surgery rates among African Americans have been noted for lung cancer[46,50] and colorectal cancer.[30,49]

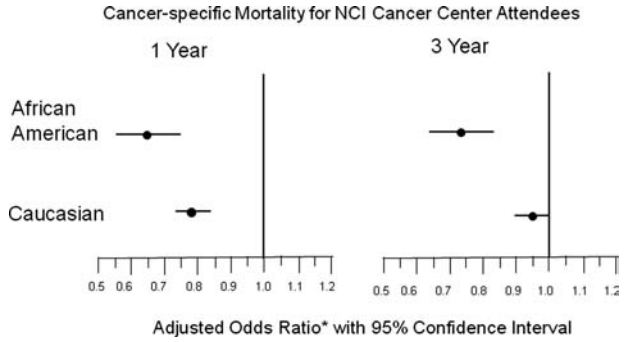

Figure 2. Predictive models of 1-year and 3-year cancer-specific mortality are illustrated as a function of National Cancer Institute (NCI) cancer center attendance among Medicare beneficiaries with an incident diagnosis of breast, lung, colon/rectal, or prostate cancer as identified in Surveillance, Epidemiology, and End Results (SEER)-Medicare data from 1998 through 2002. Adjusted models include the covariates age at diagnosis, sex, travel time to the nearest NCI cancer center, predominance of primary care before diagnosis, stage, rurality, comorbidities, median household income for zip code of residence at diagnosis, SEER registry of residence at diagnosis, and year of diagnosis.

Like any observational research, in the current results, there is the potential for bias related to unmeasured factors that differed between the comparison groups. We accounted for this by adjusting analyses, examining clustered correlations, and performing subanalyses. Because this study question is not amenable to randomization, we believe these results are important, although they should interpreted cautiously. Also inherent in observational research is the potential for lead-time bias to distort measures of survival/mortality. In our study, we attempted to minimize this possibility by controlling for stage at diagnosis. Although such a bias is possible, it is unlikely that our results for lung cancer were influenced by lead-time bias, because lung cancer currently is not screened for routinely, and clinical interventions typically yield only a modest benefit. We were unable to examine patients who received no hospital-based services and those of other racial/ethnic groups (because of insufficient sample size). Finally, we could not ascertain complete provider use longitudinally, such as office-based physician visits.

The current study suggests that, when care is received in similar, specialized cancer care settings, African-American and Caucasian cancer patients have

Table 4. Predictive Models of 1-Year and 3-Year Mortality as a Function of National Cancer Center Cancer Center Attendance in African-American Medicare Beneficiaries With an Incident Diagnosis of Breast, Lung, Colon/Rectal, or Prostate Cancer as Identified in Surveillance, Epidemiology, and End Results-Medicare Data[a]

	Mortality: OR (95% CI)[b]			
	Attended an NCI Cancer Center		Did Not Attend an NCI Cancer Center	
African Americans vs Caucasians	All-Cause	Cancer-Specific	All Cause	Cancer-Specific
1-Year mortality	0.95 (0.77-1.17)	0.95 (0.76-1.19)	1.15 (1.09-1.21)	1.14 (1.08-1.21)
3-Year mortality	0.98 (0.82-1.18)	1.00 (0.82-1.21)	1.23 (1.17-1.28)	1.26 (1.20-1.33)

OR indicates odds ratio; CI, confidence interval; NCI, National Cancer Institute.
[a]Attendance was defined as 2 or more claim days in the first 12 months after diagnosis.
[b]Adjusted models included the covariates age at diagnosis; sex; travel time to the nearest NCI cancer center; predominance of primary care before diagnosis; stage; cancer site; rurality; comorbidities; Surveillance, Epidemiology, and End Results registry of residence at diagnosis; and year of diagnosis.

similar risk for mortality. These results extend previous research and have implications for efforts to address racial disparities in cancer outcomes. From a clinical perspective, primary care physicians may wish to focus increased effort on early cancer detection in African-American patients to address disparities in stage at diagnosis and on referral patterns that incorporate performance measures, which may optimize cancer care and outcomes. From a policy standpoint, this study augments the impetus for validated, public reporting of quality measures for cancer care. If it is determined that these results are generalizable to other cancer care settings, then patients, referring physicians, healthcare organizations, and policy makers should place a premium on reliable, facility-level, quality reporting to maximize equal benefits for all patients.

CONFLICT OF INTEREST DISCLOSURES

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